BUILDING 3001 (NPL SITE)
PROPOSED PLAN
TINKER AIR FORCE BASE

OKLAHOMA CITY, OKLAHOMA

INSTALLATION RESTORATION PROGRAM
PROJECT NO. WWYK89-0310B
SITE IDENTIFICATION NO. TINKER-WP30

FINAL

MARCH 1990

US Army Corps
of Engineers

Tulsa District

BUILDING 3001
PROPOSED PLAN

TINKER AIR FORCE BASE
INSTALLATION RESTORATION PROGRAM
PROJECT NO. WWYK89-0310B
SITE NO. TINKER 01

PREPARED FOR:
ENVIRONMENTAL MANAGEMENT DIRECTORATE
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS OKLAHOMA CITY AIR LOGISTICS CENTER

PREPARED BY:
U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT

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BUILDING 3001 PROPOSED PLAN

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BUILDING 3001 PROPOSED PLAN

1.0 General. This Proposed Plan (Plan) is issued to describe the options for remediating groundwater contamination under Building 3001 located at Tinker Air Force Base (AFB), Oklahoma.

2.0 Introduction. The Plan is a summary of the cleanup alternatives that Tinker has considered for remediating groundwater contamination at Building 3001. It also presents and evaluates remedial alternatives preferred by the Air Force, which is the owner of the site and the lead agency for Building 3001. The alternatives summarized in the Plan are described in the Feasibility Study (FS) report, (COE, 1989) for Building 3001, Screening of Remedial Control Measures and Technologies reports, (PELA, 1988) and Preliminary Development and Evaluation of Groundwater Treatment and Disposal Alternatives, (B&V, 1988). These reports present a more in depth description of all of the alternatives. These reports are included in the Administrative Record and should be consulted for detailed information.

2.1 Purpose and Scope. Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requires publication of a notice and brief analysis of a Proposed Plan for site remediation. The Plan also must be made available to the public. This Proposed Plan provides background information on the site, describes the alternatives being

considered to remediate contaminated groundwater at the site, presents the rationale for identification of the preferred alternatives, and outlines the public's role in helping EPA make a final decision on a remedy.

2.2 Site Background. Tinker AFB is located in central Oklahoma, in the southeast portion of the Oklahoma City metropolitan complex, in Oklahoma County, as shown on Figure 1 and Figure 2. The Building 3001 houses an aircraft overhaul and modification facility to support the mission of the Oklahoma City Air Logistics Center. Industrial operations at the site began in 1942. Many of these operations used or generated solutions containing solvents and/or heavy metals. Trichloroethylene (TCE) was used as the primary solvent in Tinker's degreasing operations until the early 1970's. The wastewater from the plating shop and paint stripping operations contained high concentrations of solvents and heavy metals, particularly hexavalent chromium (Cr^{+6}).

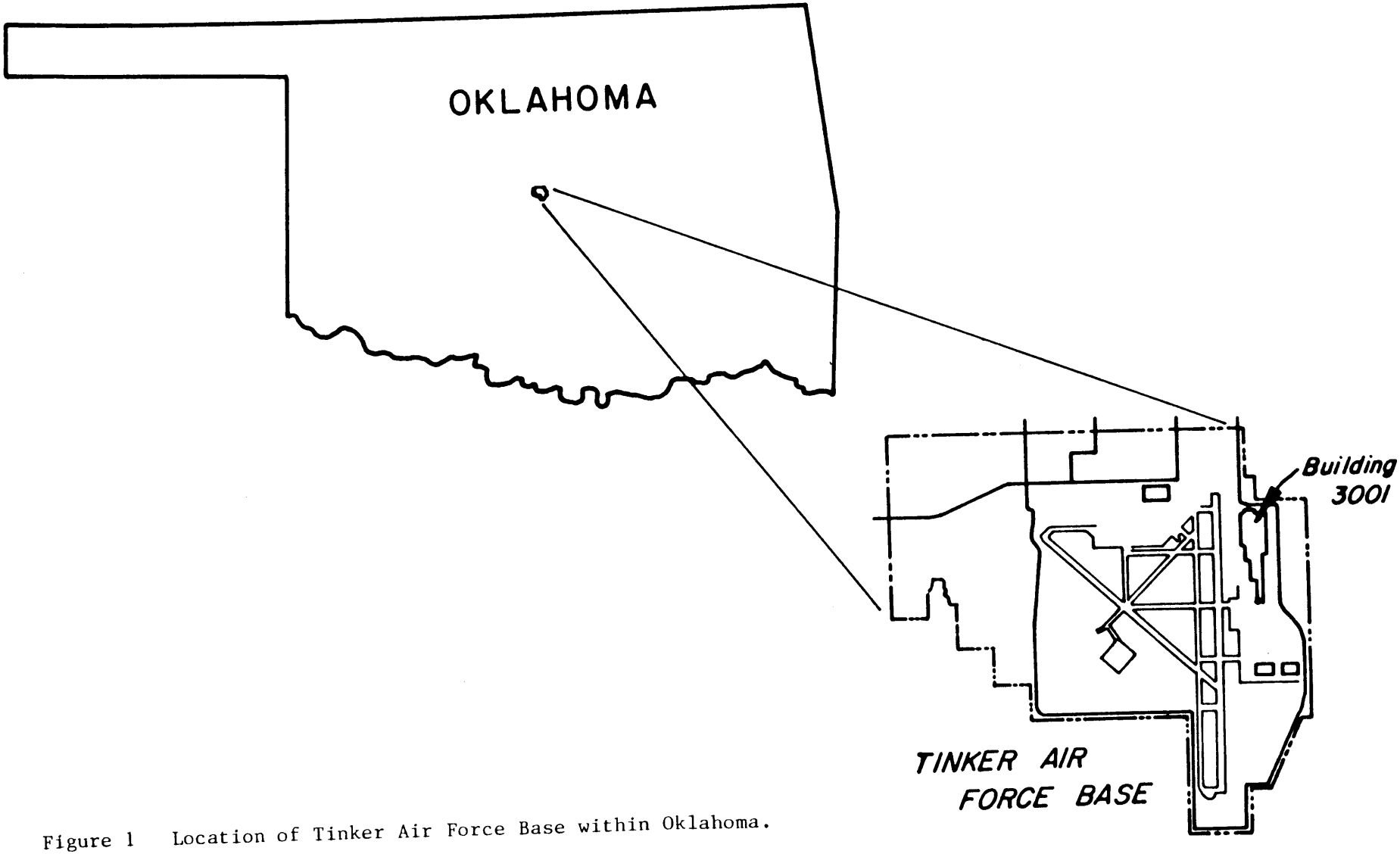

Figure 1 Location of Tinker Air Force Base within Oklahoma.

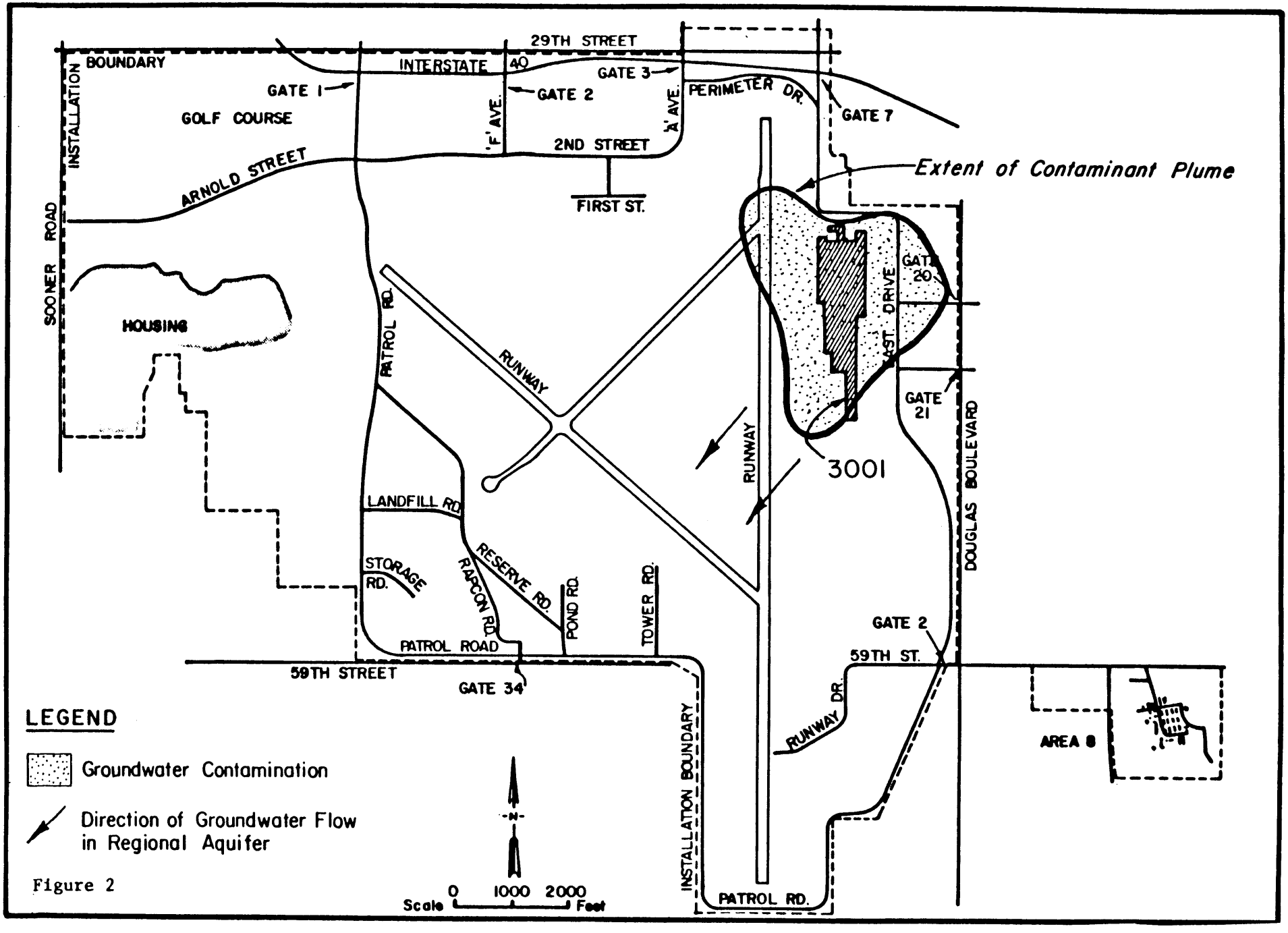
29TH STREET
INSTALLATION BOUNDARY
INTERSTATE 40
GATE 1
GATE 2
GATE 3
GATE 7
PERIMETER DR.
GOLF COURSE
'F' AVE.
'A' AVE.
2ND STREET
ARNOLD STREET
FIRST ST.
SOONER ROAD
Extent of Contaminant Plume
HOUSING
PATROL RD.
RUNWAY
GATE 20
AST DRIVE
GATE 21
3001
RUNWAY
DOUGLAS BOULEVARD
LANDFILL RD.
STORAGE RD.
RAPCON RD.
RESERVE RD.
POND RD.
TOWER RD.
PATROL ROAD
59TH STREET
GATE 34
GATE 2
59TH ST.
RUNWAY DR.
AREA B
INSTALLATION BOUNDARY
PATROL RD.
LEGEND
Groundwater Contamination
Direction of Groundwater Flow in Regional Aquifer
N
0 1000 2000
Scale Feet

Figure 2

2.3 Site Investigation. TCE and Cr^{+6} are the major contaminants that were identified to be a hazard to human health and the environment. The Risk Assessment, (COE 1988), determined that there was not any significant risk to the short-term human health and the environment. However, remedial action is to be taken in order to insure that the site will not pose any future risks. Figure 2 shows an outline of the area of groundwater contamination for TCE and Cr^{+6} and the direction of regional groundwater flow. The groundwater contamination is located in the perched aquifer and uppermost portions of the regional aquifer and extends horizontally 220 acres and vertically down to the top of regional aquifer. Nearby active base water supply wells are located deeper in the more productive zones of the aquifer. Contaminants have not been detected in the active water supply wells at concentrations above federal drinking water standards or maximum contaminant levels (MCL).

The site was placed on the National Priorities List (NPL) in July 1987. Between 1986 and 1989, TAFB conducted a Remedial Investigation and Feasibility Study (RI/FS) under the guidance of the EPA and OSDH. The RI/FS was conducted to define and characterize the sources, extent, and magnitude of contamination and to provide a detailed description and evaluation of remedial action alternatives for remediating the

site. The results of the RI/FS show that contaminated groundwater at the site is the primary public health and environmental concern.

3.0 Scope and Role of Operable Unit or Response Action. The contaminated groundwater at Building 3001 will be treated as one operable unit (OU). The response action for the OU will be conducted in two stages:

1) Groundwater Pumping/Collection
2) Groundwater Treatment and Disposal

The alternatives under consideration for cleaning up the contaminated groundwater at the site are presented on page 7. Among these are the alternatives currently preferred for addressing the contaminated groundwater. All of the remedies being considered are analyzed on pages 7 through 16. Pages 7-11 describe the alternatives in terms of technologies, processes, and cost, while pages 12-16 evaluate and compare the alternatives to EPA's nine evaluation criteria. The RI/FS reports present a more thorough description and evaluation of the alternatives.

Based on new information or public comment, TAFB in consultation with EPA and OSDH may modify the preferred alternative or select another response action presented in this Plan and the RI/FS reports, COE 1988 and 1989. The public is

encouraged to review and comment on all of the alternatives identified in this Plan. The RI/FS reports for Building 3001 should be consulted for more information on these alternatives.

4.0 Summary of Alternatives. The response action alternatives presented below are numbered to correspond with the numbers in the FS report. The alternatives for groundwater pumping/collection are:

Alternative 1-1: No Action

Alternative 1-2: Exterior Wells

Alternative 1-3: Exterior Wells and Interior Wells

The alternatives for groundwater treatment and disposal are:

Alternative 2-1: Modified IWTP/Industrial Reuse

Alternative 2-2: Modified IWTP/Surface Water Discharge

Alternative 2-3: Treatment/Reuse

Alternative 2-4: Treatment/Surface Water Discharge

4.1. Groundwater Removal and Collection

Alternative 1-1 - No-Action

Estimated Construction Cost:	$103,000
Estimated Annual Operation & Maintenance (O&M) Cost:	$ 41,600
Estimated Present Worth:	$535,000

Estimated Time to Implement: 6 months

(All costs and implementation times are estimated)

The CERCLA Program requires that the "No Action" alternative be considered at every site. Alternative 1-1 does not involve any pumping of contaminated groundwater. It would consist of the installation of additional monitoring wells in order to monitor the groundwater contaminant plumes and surface water at East Soldier Creek.

Alternative 1-2 - Exterior Wells

Estimated Construction Cost:	$2,707,149
Estimated Annual O&M Costs:	$ 127,900
Estimated Present Worth:	$4,036,030
Estimated Time to Implement: 24 months	

This alternative includes the groundwater monitoring program for Alternative 1-1 and the installation of 111 extraction wells to be located around the exterior of Building 3001. Pumping the groundwater around the exterior of Building 3001 will lower the groundwater elevation in the vicinity of the pumping wells thus controlling the vertical and horizontal migration of contaminated groundwater.

Alternative 1-3 - Exterior and Interior Wells

Estimated Construction Cost:	$3,408,903
Estimated Annual O&M costs:	$ 142,160
Estimated Present Worth:	$4,885,950
Estimated Time to Implement: 24 months	

This alternative is similar to Alternative 1-2. The 111 exterior wells will be combined with 18 interior wells. The addition of interior wells will increase the amount of contaminated groundwater pumped from the aquifer zones. The 18 interior wells will be located in the areas of highest contaminant concentrations directly under the building. The exact number of wells may vary depending upon the final design of the groundwater extraction system. This alternative will decrease the vertical and horizontal migration of contaminated groundwater and increase the rate of contaminated groundwater to be pumped from the aquifer.

4.2. Groundwater Treatment and Disposal

Alternative 2-1 - Modified IWTP/Industrial Reuse

Estimated Construction Cost:	$ 811,400
Estimated Annual O&M Cost:	$ 27,000
Estimated Present Worth:	$1,092,000
Estimated Time to Implement: 36 months	

Alternative 2-1 would consist of modifying the existing Industrial Waste Treatment Plant(IWTP) to treat the contaminants in the groundwater at the Site. The process would consist of air stripping to remove TCE and other volatile organic contaminants, removing Cr and other metals through a metals reduction/precipitation process, and removing any residual organic compounds using biological treatment. The effluent would

be reused in Tinker's industrial operations.

Alternative 2-2 - Modified IWTP/Surface Water Discharge

Estimated Construction Cost:	$ 811,400
Estimated Annual O&M Cost:	$ 27,000
Estimated Present Worth:	$1,092,000
Estimated Time to Implement:	12 months

Alternative 2-2 differs from Alternative 2-1 only by the effluent discharge destination. The effluent from Alternative 2-2 will be discharged to East Soldier Creek via the IWTP outfall.

Alternative 2-3 - Treatment/Industrial Reuse

Estimated Construction Cost:	$1,530,700
Estimated Annual O&M Cost:	$ 104,300
Estimated Present Worth:	$2,651,100
Estimated Time to Implement:	36 months

This alternative consists of constructing a new treatment facility specifically for removing contaminants from the groundwater at Building 3001. The volatile organic contaminants would be removed by air and/or steam stripping, a metals precipitation process would extract heavy metals and an optional fine filtration process would be used to remove non-volatile organics and the remaining metal concentrations. The treated groundwater would be primarily reused in Tinker's industrial

operations. Since the completion of the Feasibility Study (FS) Tinker has identified the Best Developed and Available Technology (BDAT) for removal of contaminants which is summarized in Appendix A.

Alternative 2-4 - Treatment/Surface Water Discharge

Estimated Constructive Cost:	$1,530,700
Estimated Annual O&M Cost:	$ 104,300
Estimated Present Worth:	$2,651,100
Estimated Time to Implement:	24-36 months

Alternative 2-4 differs from Alternative 2-3 only by the effluent discharge destination. Alternative 2-4 will discharge the effluent to East Soldier Creek via a new outfall structure.

5.0 Evaluation of Alternatives. The preferred alternatives for pumping, collecting, treating and disposing of contaminated groundwater at the site is Alternative 1-3, Exterior and Interior Wells, and Alternative 2-3, Treatment/Industrial Reuse. Based on current information these alternatives provide the best site remediation. The National Contingency Plan (NCP) requires that the alternatives meet nine evaluation criteria. This section provides a glossary of these criteria and an analysis of the alternatives under consideration for the site.

5.1 Glossary of Evaluation Criteria.

A) Overall Protection of Human Health and the Environment addresses whether or not a remedy provides adequate protection to human health and the environment.

B) Compliance with ARARs addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements (ARARs) of other environmental statutes.

C) Long-term Effectiveness and Permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

D) Reduction of mobility, toxicity, or volume is the anticipated performance of the treatment technologies a remedy may employ.

E) Short-term Effectiveness involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

F) Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution. A bench-scale study can be conducted during the design phase of the chosen alternative. If necessary, a treatability study may also be performed before the completion of

final design.

G) Cost includes capital and operation and maintenance costs.

H) State Acceptance indicates whether the State concurs with, opposes, or has no comment on the preferred alternative.

I) Community Acceptance will be assessed in the Record of Decision following a review of the public comments received on the RI/FS reports and the Proposed Plan.

5.2 Nine-Point Evaluation Criteria Evaluation Overall.

5.2.1 Protection. All of the alternatives, with the exception of the no-action alternative would provide adequate protection of human health and the environment by eliminating, reducing, or controlling risk through treatment using engineering controls, or institutional controls. The preferred alternatives will remove the contaminated groundwater and treat it to achieve concentration levels to satisfy the permitted discharge standards.

5.2.2 Compliance with ARARs. All the alternatives with the exception of the no-action alternative will meet all applicable or appropriate and relevant requirements (ARARs) of Federal and State environmental laws.

5.2.3 Longterm Effectiveness and Performance. Alternative 1-1 would not reduce the concentration of contaminants in the groundwater thus increasing the risk of exposure to the drinking water zone. The preferred alternative, Alternative 1-3, would significantly reduce the risk of exposure to the drinking water zone by collecting the highly contaminated groundwater in the upper zones from under the interior and exterior of Building 3001.

Of the alternatives developed for treatment and disposal of contaminated groundwater, Alternative 2-3 provides the best site remediation. All of the alternatives would treat the contaminants to meet regulated concentration levels, minimize further migration into the lower aquifers and adequately protect human health and the environment. Alternatives 2-1 and 2-2 would require modifications to the existing IWTP to handle the additional wastestream from the Building 3001 site. The preferred alternative, Alternative 2-3, would require the construction of a new treatment facility for treating only the contaminants from the Building 3001 site.

5.2.4 Reduction of Mobility, Toxicity, or Volume of the Contaminants. The no-action alternative would not reduce the toxicity, mobility, or volume of the contaminants in the groundwater. Alternatives 1-2 and 1-3 would reduce the mobility and volume of the contaminated groundwater. Based upon the

Feasibility Study it was determined that the preferred alternative would remove approximately 94% and 96% of TCE and Cr from the groundwater respectively over an estimated 30-year time period. The length of time to remove the groundwater is due to the thinness and low permeability of the aquifer zones. The treatment would significantly reduce the migration of contaminants into the lower portion of the regional aquifer thus eliminating the risk to the drinking water aquifer.

All of the alternatives for treatment and disposal would treat the contaminants in the groundwater. All of the alternatives would use air and/or steam stripping to remove volatile organic contaminants and a metals treatment process to remove heavy metals. Alternatives 2-1 and 2-2 would use sludge units to remove nonvolatile organics. Alternatives 2-3 and 2-4 would use a fine filtration process unit to remove nonvolatile organics. The preferred alternative will reduce the contaminant concentration levels below the regulated concentration levels.

5.2.5 Short-term Effectiveness. The alternatives for pumping and collecting the contaminated groundwater would pose no short-term effect to the environment and surrounding populations. A potential may exist for short-term health impacts during operation and maintenance of the treatment facilities through inhalation of vapors (Risk Assessment, 1988).

5.2.6 Implementability. Alternative 1-1 presents the fewest obstacles to fast and complete implementation. Alternative 1-3 would be difficult to construct due to site restrictions. Administrative activities could also delay implementation. There would be no adverse site conditions to affect the construction of any of the groundwater treatment and disposal alternatives. Alternative 2-3 will require the greatest amount of time needed to be implemented. All of the alternatives would require about the same amount of time for achieving the expected results discussed in the FS.

5.2.7 Cost. The estimated construction cost for each of the alternatives is Alternative 1-1: $ 103,000

Alternative 1-2:	$2,707,149
Alternative 1-3:	$3,408,903
Alternative 2-1:	$ 811,400
Alternative 2-2:	$ 811,400
Alternative 2-3:	$1,530,700
Alternative 2-4:	$1,530,700

The construction cost for the preferred alternatives are greater than the remainder of the alternatives. However, they utilize the best technologies for obtaining the desired results.

5.2.8 State Acceptance. This criterion will be addressed in the Record of Decision (ROD) following the public comment period.

5.2.9 Community Acceptance. This criterion will be addressed in the Responsiveness Summary and attached to the Building 3001 ROD following the public comment period.

6.0 The Preferred Alternative. The preferred alternatives, Alternatives 1-3 and 2-3 would use proven treatment techniques. These techniques would reduce the contaminants of concern, TCE and chromium, in the groundwater to levels well below the regulated cleanup levels. Alternative 1-3 would consist of an exterior and interior groundwater collection program. Alternative 2-3 would treat the contaminated groundwater at a separate treatment facility. The treated groundwater would be used in Tinker's industrial operations. Although some contaminated groundwater would remain at the site, the removal and treatment of volatile organic compounds and heavy metals would reduce the level of long-term monitoring necessary to ensure the continued viability of the remedies. The equipment and skilled laborers necessary to construct the preferred alternatives are currently available.

In summary, at this time the preferred alternatives represent the best balance among the evaluation criteria used to evaluate remedies. Based on the information available at this time, therefore, the EPA and the OSDH believe the preferred alternative would be protective, would attain ARARs, would be cost effective, and would utilize permanent solutions employing alternative or

resource recovery technologies to the maximum extent possible.

7.0 The Word Notebook.

Specialized terms used elsewhere in this Proposed Plan are defined below.

Applicable or Relevant and Appropriate Requirements (ARARs) - refers to the federal and state requirements that a remedy must attain.

Aquifer - a formation that contains saturated permeable material to yield significant quantities of water to wells and springs.

Building 3001 - shall mean the area underlying or adjacent to Building 3001 located on Tinker Air Force Base which has been contaminated by the migration of hazardous substances, pollutants, or contaminants which have been released from Building 3001.

Chromium - Found primarily in Tinker`s paint stripping operations. Most of Chromium detected at Tinker was hexavalent. Hexavalent Chromium is considered a greater health threat than any other chromium species.

Contaminants - any element, substance, compound, or mixture,

including disease causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingesting through food chains will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions or physical deformation in such organisms or their offspring.

Contaminant plume - a column of contamination with measurable horizontal and vertical dimensions that are suspended and move with groundwater.

Drinking water aquifer - the aquifer from which water is pumped for human consumption.

Drinking Water Standards - the standards specify contaminants which may have any adverse effect on health of persons and their maximum contaminant levels.

Feasibility Study (FS) - The evaluation, development, and design of remedial alternatives as defined in 40 CFR Part 300 for Building 3001.

Groundwater - water in a saturated zone or stratum beneath the surface of land or water.

Maximum Contaminant Levels (MCLs) - the maximum permissible level of a contaminant in water which is delivered to any user of a public water system.

Remedial Investigation (RI) - The RI involves investigating and characterizing a site in order to define the extent and magnitude of contamination of site.

Site - shall mean Building 3001 and the areal extent of contamination areas in close proximity to Building 3001.

8.0 The Community's Role In The Selection Process.

Tinker AFB solicits input from the community on the cleanup methods proposed for this response action. Tinker has set a public comment period from March 19, 1990 to April 18, 1990 to encourage public participation in the selection process. The comment period includes a public meeting at which TAFB will present the RI/FS reports and Proposed Plan, answer questions, and receive both oral and written comments.

The public meeting is scheduled at 7 p.m. April 5, 1990 and will be held at the Midwest City Library.

If special assistance is needed because of physical limitations, vision or hearing impairments, please contact Mr. Michael Johnson, Tinker Public Affairs Office, at (405) 739-2215

before April 5, 1990. Every effort will be made to ensure that all of the participants can be involved in the decision-making process.

Comments will be summarized and responses provided in the Responsiveness Summary section of the Record of Decision (ROD). The ROD is the document that presents Tinker's final selection for cleanup. The public can send written comments to or obtain further information from:

OC-ALC/PAX
Attn: Michael Johnson
Tinker Air Force Base, Oklahoma 74145

TAFB, EPA, and OSDH are soliciting public comments about the most acceptable way to clean up the Building 3001 site. The Proposed Plan and the RI/FS report have been placed in the Information Repositories and Administrative Record for the site at the address shown below. The Administrative Record includes all documents such as work plans, data analyses, public comments, transcripts, and other relevant material used in developing the remedial alternatives for the Building 3001 site. These documents are available for public review and copying at the following location:

Midwest City Library
8143 E. Reno
Midwest City, OK 73110

REFERENCES

1. U.S. Army Corps of Engineers, Tulsa District, Building 3001 Feasibility Study, August 1989

2. P.E. LaMoreaux and Associates, Inc., Screening of Remedial Control Measures and Technologies, May 1988

3. Black and Veatch, Preliminary Development and Evaluation of Groundwater Treatment and Disposal Alternatives, September 1988

4. U.S. Army Corps of Engineers, Tulsa District, Building 3001, Risk Assessment, August 1988

5. U.S. Army Corps of Engineers, Tulsa District, Building 3001 Remedial Investigations, January 1988

Appendic A
Aquadetox Process

Aquadetox Process

The Aquadetox process, developed by Dow Chemical is patented for removal of high boiling organic compounds. This process has been found to be effective in removal of most of the organic compounds which are listed as hazardous by the Environmental Protection Agency (EPA). The stripping technology, whether an air stripper or a steam stripper, can provide over 99.9% removal efficiently. The effluent from this process will have nearly non-detectable concentration of the organic contaminants. The Aquadetox process is also approved under the EPA's Superfund Innovative Technology Evaluation (SITE) program. This technology, working at over 10 locations, eliminates any carbon polishing of the effluent water. The conventional air stripping as addressed in the FS provides only about 90-95% removal of volatile organic compounds.

The metals removal process consists of reduction of hexavalent chromium to trivalent chromium using Sodium Metabisulfite followed by precipitation of heavy metal hydroxides using Sodium Hydroxide. The effluent will then be clarified using a flocculating agent. The effluent is then given a final pH adjustment, tested, and reused at the Tinker's industrial operations. The precipitated sludge will be dewatered by a sludge dewatering process. The final sludge cake will be disposed of at an approved disposal facility. The quantity of sludge generated by this process is expected to be 75% less than

that generated by the Ferrous Sulfate process as addressed in the FS.

The effluent from the precipitation process is expected to have a chromium concentration of about 20-50 ppb. A final polishing process after the precipitation process may be used to further reduce the concentration of chromium to 10-20 ppb. The polishing process may be kept as optional and will be used if the effluent concentration of chromium is found to be any higher than 50 ppb. The automated control mechanism will be set up to route the water through the polishing process if and only if the concentration of chromium in the effluent is over 50 ppb or any other desired value. The polishing process can involve fine filtration.

The whole process is planned to be completely automated with tank liquid level, pH, and ORP measurements and alarm tied to the central control room.